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AMERICAN SPECIES OF LEDERMUELLERIA AND  
LEDERMUELLERIOPSIS, WITH A NOTE ON NEW SYNONYMY  
IN NEOGNATHUS

(ACARINA, STIGMAEIDAE, CALIGONELLIDAE).

F. M. SUMMERS, *University of California, Davis*

The mites that Oudemans (1923) referred to his genus *Ledermuelleria* comprise a homogeneous group of stigmaeids having globate bodies almost completely encased in an ornamented exoskeleton. They occur as thinly dispersed inhabitants of ground litter, leaf mold, moss, and meadow land. Three of the four *Ledermuelleria* species and the one species of *Ledermuelleriopsis* collected principally in California are species described from Europe. Redescriptions of the named species are needed because existing descriptions do not clearly indicate their distinguishing features.

A distinctive feature of these two genera is the extensive encasement of the hysterosoma by one (*Ledermuelleria*) or two (*Ledermuelleriopsis*) dorsal plates. These plates constitute a carapace-like covering over the entire dorsum and sidewalls of the hysterosoma. The humeral (scapular) plate on each side is displaced to a pleuro-ventral position.

**LEDERMUELLERIA** Oudemans

*Ledermuelleria* Oudemans, 1923, Ent. Ber. 6(130):150.

Globate, red or straw-colored mites with stubby legs and mouthparts. Palpus 5-segmented, thickset, longer than extended chelicera by two distal segments; overall length not greater than combined lengths of genu, tibia, and tarsus of leg I. Primary claw of palptibia well-developed, with a very small accessory claw anchored medially at its base. Palptarsus a slender cylinder, equal to or slightly longer than primary claw; equipped with five acicular setae, a peglike sensillum, and a stubby, trifid sensillum at its apex. Chelicerae independently movable, with retractile stylets much shorter than inflated basal segments. Idiosoma arched dorsally, its posterior end with a shallow sulcus which delimits a "caudal protuberance," on the inferior surface of which is located a pair of ano-genital valves. Dorsum almost wholly shielded with three sculptured plates: one covering propodosoma, one covering hysterosoma to lateral margins of venter, and one caudal plate covering posteriormost protuberance and part of ventral opisthosoma. Humeral (scapular) plate large, triangular, displaced ventrally with apex intruding between coxae II and III. All of these plates tessellated or uniformly dimpled. Two or four sternal plates; the two between opposite

coxal groups on propodosoma may unite in midventral line to form a single "prosternum"; the two on metapodosoma may be separate or joined into a "metasternum." Sternal and genital plates delicate, not usually sculptured. Eyes: apparently one on each side with a clearly discernible refractile body. Twenty-six dorsal setae, including two ventrally displaced humerals and four on caudal plate. Ventral setae simple, four to six pairs, not including three pairs on anal portion of ano-genital valves. Anal and genital apertures not separated externally. Setae and special sensilla of appendages closely follow pattern described for Stigmaeidae (Grandjean, 1944) with but minor variations between species. Empodia I to IV each with three pairs divergent, capitate tenent hairlets.

**Ledermuelleria segnis** (Koch)

(Figs. 1-4)

*Caligonus segnis* Koch, 1836, Deutschlands Crustaceen, Myriapoden und Arachniden, Fasc. 5, No. 10.

*Raphignathus ruber* Koch, 1842, Uebersicht des Arachnidensystems 3(3):56, Pl. V, Fig. 38.

*Raphignathus piger* (Schränk). Berlese, 1885, Acari, Myriapoda et Scorpiones hucusque in Italia Reperta. Ordo Prostigmata, Fasc. XXII, No. 1, Pl. 84.

*Ledermuelleria segnis* (Koch). Oudemans, 1923, Ent. Ber. 6(130):150.

The mite described by Koch (1836) as *Caligonus segnis* is a distinctive species, such that his figure of this species permits recognition beyond reasonable doubt. Also described and illustrated in the same monograph were *Caligonus piger* and *C. ruber*. The nomenclature of these three species became confused in Koch's synoptic work of 1842. This time he illustrated *C. segnis* but applied to it the name *Raphignathus ruber* (Fig. 28). In like manner, another mite which he first named *C. ruber* is again illustrated but under the name of *C. piger*. At a later date, Berlese (1885) redescribed the animal here considered to be conspecific with *C. segnis*, but he called it *Raphignathus piger* (Schränk). Sample specimens of this mite from California were sent to Dr. G. Lombardini, Florence, Italy, who found them to be identical with specimens identified by Berlese as *R. piger* (Schr.).

The synonymy of the three species as given by Oudemans (1923) does not clarify the nomenclature. According to Oudemans's belief, *Caligonus ruber* Koch belongs in the genus *Nicoletiella* (= *N. cornuta* Can. et Fanz.). Another complication appears in *Podaia*. *Acarus ruber* Schrank, 1776 (= *A. rubens* Schr., 1781) was made the type of *Podaia* by Oudemans (1923). Oudemans also believed that *A. rubens* Schr. = *Caligonus piger* Koch. Although *Podaia* is a genus of doubtful status at the present time, it is clear that Schrank's figure of *Acarus ruber* (1776) does not depict a species which should be included in *Ledermuelleria*.

*Female*.—Sculpturing of dorsal plates appears as numerous, deeply indented pits, oval to circular in outline, closely and evenly spaced, of uniform size; each approximately 11  $\mu$  in diameter. Lining of each pit coarsely granular. Dorsal setae bowed or curved, sickle-like, with alveoli on elevated tubercles; all denticu-

late, with serrations bilateral; axes tapering to finely pointed tips. Tubercles of first dorso-medians (verticales) located forward, in an inferior position on part of propodosoma overhanging cheliceral bases. Setae of dorso-median rows as long or longer than distance between alveolus of any one and that next behind; second dorso-median setae (adjacent to eyes) slightly longer (ca.  $75\ \mu$ ) than others on propodosoma but not longer than dorso-medians on hysterosoma; four shortest on caudal plate. Two sternal plates of propodosoma continuous across mid-ventral line to constitute a prosternum. Sternal plates of metapodosoma incompletely fused in mid-ventral line. Genital plate not distinctly separated from caudal plate surrounding ano-genital area. Genital plate expanded to cover a broad area of opisthosoma close behind sternal plates of metapodosoma, bearing but one pair of widely spaced genital setae. Genu I bears three setae of common type plus a minute spiniform sensillum (épine  $\kappa$  of Grandjean); corresponding sensillum absent on genu II; each genu III and IV has but one seta of common type. Measurements (10 ♀♀): idiosoma,  $300\ \mu$  long,  $250\ \mu$  wide; leg I,  $170\ \mu$  from base of trochanter to tips of claws.

*Male*.—Not observed.

*Collection Data*.—Green Valley, Solano County, Calif., Dec. 1, 1948 (H. E. Cott and S. F. Bailey), *ex* manzanita leaf mold. Mount Diablo, Contra Costa County, Calif., Dec. 30, 1948 (H. E. Cott and S. F. Bailey), *ex* manzanita leaf mold. Smithfield Canyon, Utah, Mar. 16, 1949 (G. F. Knowlton and Shi-Chun Ma), *ex* maple leaves. Cobb Mountain, Lake County, Calif., May 5, 1950 (W. J. Wall and S. F. Bailey), *ex* oak and pine leaf mold. Torrey Pines Park, San Diego County, Calif., Dec. 28, 1950 (R. M. Bohart), *ex* pine leaf mold. Auburn, Calif., Mar. 11, 1951 (E. I. Schlinger), *ex* pine leaf mold. Quincy, Calif., Forest Range and Experiment Station, Apr. 1, 1951 (F. M. Summers), *ex* manzanita leaf mold. Altadena, Calif., Dec. 24, 1951 (E. I. Schlinger), *ex* leaf mold, *Quercus agrifolia*. Mount Pinos, East Ventura County, Calif., May 2, 1952 (S. F. Bailey), *ex* manzanita leaf mold. Said Valley, Lassen County, Calif., July 30, 1952 (W. C. Bentlinck), *ex* ground litter.

**Ledermuelleria clavata** (Can. e Fanz.)

(Figs. 5-6)

*Caligonus clavatus* Canestrini e Fanzago, 1876, Atti d. Soc. Veneto-Trentina di Sci. Nat. 5 (1): 135. *Id.*, 1877, Atti R. Inst. Veneto di Sci. Lett. ed Arti 4 (5): 154, Pl. 4.

*Raphignathus clavatus*, G. Canestrini, 1889, Ibid. 7 (ser. 6): 508, Pl. 11, Figs. 41, 43. A. Berlese, 1885, Acari, Myr. et Scorp. Ital., Fasc. XXII, No. 2, Pl. 86, Figs. 1-8.

[?] *Raphignathus sphagneti* Hull, 1918, Trans. Nat. Hist. Soc. Northumberland, Durham, Newcastle-upon-Tyne 5:30, Pl. 3, Figs. 70-72. NEW SYNONYMY. *Ledermülleria clavatus*, Oudemans, 1923, Ent. Ber. 6 (130): 151.

*Female*.—Dorsal plates sculptured with pits or dimples so closely set that their elevated margins are polygonal in outline, producing a netlike appearance. Lining of pits membranous, appearing as a circular depression in center of each polygon.

Dorsal setae stubby, bayonet-like, evenly tapered from base to greatest thickness near tips; bluntly pointed; axial core differentiated from hyaline sheath, the latter showing few incipient denticulations. Setae of dorso-median rows much shorter than distance between alveolus of any one and that next behind, their alveoli not on conspicuous tubercles. First dorso-median pair (verticales) on upper surface; second dorso-median pair (nearest to eyes) longer ( $60\ \mu$ ) than others on propodosoma; shortest of dorsal setae about two-thirds the length of the longest ones. Plates on venter of idiosoma, integumental covering of gnathosoma and basal segments of legs faintly show sculpturing as on dorsum. Two sternal plates of propodosoma and two of metapodosoma not united with each other across mid-ventral line. Genital plate discrete, narrow, its anterior margin semi-circular; with three pairs subequal setae bordering genital area. Caudal protuberance pendant beneath opisthosoma, its hindermost margin not visible from above. Each genu I and II has three setae of common type plus a minute spiniform sensillum; each genu III and IV has but one seta of common type. Measurements (3 ♀ ♀): Idiosoma,  $430\ \mu$  long,  $340\ \mu$  wide; leg I,  $210\ \mu$  from base of trochanter to tips of claws.

*Male*.—Not observed.

*Collection Data*.—Millie Spring, Allen Canyon, Utah, July, 1950 (G. F. Knowlton and S. L. Wood), *ex* moss. Garden City, Utah, Mar. 16, 1950 (G. F. Knowlton and Shi-Chun Ma), *ex* poplar humus.

***Ledermuelleria pectinata* (Ewing)**

(Figs. 7-8)

*Raphygnathus pectinatus* Ewing, 1917, Bull. Amer. Mus. Nat. Hist. 37:151, Pl. I, Fig. 23.

*Ledermülleria pectinatus*, Oudemans, 1923, Ent. Ber. 6 (130):152.

*Eustigmaeus granulatus* Willmann, 1951, Sitzungsab. der Osterr. Akad. Wissensch., Mathem.-naturw. Kl., Abt. I, 160 (1-2): 137, Fig. 20. NEW SYNONYMY.

*Female*.—Dorsal plates sculptured as in *L. segnis*, with pits oval to circular in outline, evenly spaced, of uniform size, each 7 to  $9\ \mu$  in diameter. Lining of each pit coarsely granular. Dorsal setae short (to  $27\ \mu$  long), straight or slightly curved, club-shaped, with numerous whorls of coarse spinules. Alveoli set in small tubercles. Sternal plates comprise an integral prosternum and an integral metasternum; prosternum covers sternal area to base of gnathosoma. Genital plate well-separated from caudal plate widest at its anterior third, narrowed behind to width of ano-genital valves; with three pairs genital setae as illustrated. Caudal protuberance sub-terminal, tip visible from above. Each genu I and II has three setae of common type plus a minute, spiniform sensillum; each genu III and IV has but one seta of common type. Measurements (4 ♀ ♀): Idiosoma,  $310\ \mu$  long,  $230\ \mu$  wide; leg I,  $160\ \mu$  from base of trochanter to tips of claws.

*Male*.—Not observed.

*Collection Data*.—East Layton, Utah, Oct. 19, 1949 (G. F. Knowlton and Shi-Chun Ma), *ex* oak leaves. Mount St. Helena, Napa County, California, May 10, 1951 (S. F. Bailey), *ex* manzanita leaf mold.

The species here identified as *L. pectinata* (Ewing) is identical with the type specimen in the U.S. National Museum. However, it appears

that it may be one of G. Canestrini's (1889) species, possibly that which he named *Raphignathus anauniensis*. The suspected synonymy cannot be further clarified at the present time.

**Ledermuelleria lacuna**, n. sp.

(Figs. 9-10)

*Female*.—Dorsum of propodosoma with three plates: an extensive median plate having three pairs of setae and two small lateral plates, one on each side, each with one seta. Lateral plates of propodosoma overlie the ventrally displaced humeral plates. Dorsal plates sculptured with very shallow dimples best observed in profile at curved margins but not readily apparent in face view on middle of dorsum. Dorsal setae acicular, faintly denticulate; second dorso-median pair (near eyes) longest of body setae ( $48\ \mu$ ), approximately twice as long as shortest pair next nearest to eyes. Venter mostly unarmored, integument striated. Two sternal plates on propodosoma and two on metapodosoma occur as narrow flanges adjoining opposed coxal groups, hindermost pair with net-like sculpturing (probably noticed only because iodine in mounting medium stained these plates of type specimen in an unusual manner). Genital plate small, narrow, front margin truncate, with three pairs of genital setae. Caudal protuberance sub-terminal, posterior tip visible from above. Genu I bears three setae of common type plus a minute spiniform sensillum; genu II similarly equipped; no setae present on genera III and IV. Measurements (type ♀): idiosoma,  $280\ \mu$  long,  $260\ \mu$  wide; leg I,  $180\ \mu$  from base of trochanter to tips of claws.

*Male*.—Not observed.

*Holotype*.—Female, Bassetts, Sierra County, California, Aug. 21, 1952 (S. F. Bailey), *ex* sweepings from Lilliacese and willow. Type specimen deposited in the U. S. National Museum, No. 2226.

The distinctive characters of this species are: (1) simple architecture of the dorsal setae, (2) presence of two small lateral plates, one on each side of the large median propodosomal plate, (3) feeble dimpling on the median regions of the dorsal skeleton, and (4) absence of setae on genera III and IV. The description is based on a single adult specimen which is slightly folded on the left side. The characters ascribed to the species are also evident on two deutonymphs obtained from the same sample.

**LEDERMUELLERIOPSIS** Willmann

*Ledermuelleriopsis* Willmann, 1953, Sitzungsab. der Osterr. Akad. Wissensch., Mathem.-naturw. Kl., Abt. I, 162(6):487.

This genus was created by Willmann (1951) to accommodate two new Austrian species, *L. triscutata* and *L. plumosa*. The genus and first named species, *L. triscutata*, were not formally described until 1953. *L. triscutata* was designated as genotype in the later publication (Willmann, 1953).

The diagnostic feature of *Ledermuelleriopsis* is the presence of a

dorsal suture across the mid-section of the hysterosoma. The two hysterosomal plates separated by this suture are about equal in size, and each bears three pairs of setae.

**Ledermuelleriopsis plumosa** Willmann

(Figs. 11-15)

*Ledermuelleriopsis plumosus* Willmann, 1951, Sitzungsab. der Osterr. Akad. Wissensch., Mathem.-naturw. Kl., Abt. I, 160 (1-2):140, Fig. 24.

*Female*.—Dorsal plates with shallow, rounded dimples or pits closely resembling those described for *Ledermuelleria pectinata*. Dorsal setae very short (12-25  $\mu$ ), 24 of which are clavate, with numerous whorls of coarse spinules; 2 scapular setae acicular, firmly plumose, length equal to longest of other dorsal setae. Sternal plates comprise an integral prosternum and an integral metasternum; prosternum occupies venter to base of gnathosoma. Genital plate covers opisthosoma almost to metasternal plate, widest in front, with 3 pairs of genital setae. Caudal protuberance terminal, well-exposed to view from above. Each genu I and II has 3 setae of common type plus a minute spiniform sensillum; each genu III and IV has but one seta of common type. Measurements (9 ♀♀): Idiosoma, 270  $\mu$  long, 190  $\mu$  wide; leg I, 150  $\mu$  from base of trochanter to tips of claws.

*Male*.—Closely resembles female in size and proportions of gnathosoma and legs; idiosoma slightly smaller in size, more tapered from shoulders to caudal protuberance. Dorsal setae finely plumose, slender, not noticeably clavate; three posterior pairs longer (27  $\mu$ ) than other dorsals. Genital and caudal plates evidently not separate—this composite plate covers caudal protuberance and entire venter of opisthosoma to margin of metasternum. Two pairs of genital setae, posterior pair approximately twice as long as anterior pair. Anus terminal, overlying genital aperture immediately beneath. Three pairs anal setae closely clustered on anal valves; two most dorsal pairs diminutive, spurlike, both pairs situated on one pair of "paranal" papillae; third pair longer, acicular, located below and external to bases of papillae. Intromittent organ observed only in retracted condition, within body; it comprises a slender, sinuous, slightly tapered tubular or grooved sclerite, with proximal end between bases of coxae IV; distal tip associated with or ensheathed by an expanded, barblike plate as illustrated (Fig. 12). Posterodorsal wall of genital atrium provided with paired sclerites in juxtaposition, each of which has an upwardly directed, toothlike apodeme. Chaetotaxy and sensilla of legs I-IV essentially as in opposite sex, except that each tarsus bears an additional specialized sensillum; this "male tarsal organ" ("grand solénidion mâle," Grandjean, 1944) is conspicuously long, inflated, cross-striated, arising above near proximal end of each tarsus. Male tarsal organ longest on tarsus I (38  $\mu$ ), slightly shorter but similar on successive tarsi. Measurements (2 ♂♂): idiosoma, 240  $\mu$  long, 150  $\mu$  wide; leg I, 140  $\mu$  from base of trochanter to tips of claws.

*Collection Data*.—Nine females, two males, Alturas, Modoc County, California, Oct. 11, 1952 (E. I. Schlinger), *ex* juniper leaf mold. Insofar as this is the first description of the male, one of the male specimens has been deposited in the collection of the U. S. National Museum.

NEW GENERIC SYNONYMY IN THE CALIGONELLIDAE

Dr. Carl Willman, Bremen, Germany, was kind enough to call to the author's belated attention a description of *Neognathus* Willmann, 1952, which antedates an identical genus, *Stigmagnathus*, proposed by Summers and Schlinger (1955). The latter is therefore a synonym of *Neognathus*, and the status of the several species is as follows:

Genus **NEOGNATHUS** Willmann

*Neognathus* Willmann, 1952. Verofftl. Inst. Meeresforsch. Bremerhaven 1:162-63, Pl. 28, Fig. 19.

*Stigmagnathus* Summers and Schlinger, 1955, Hilgardia 23(12): 546. NEW SYNONYMY.

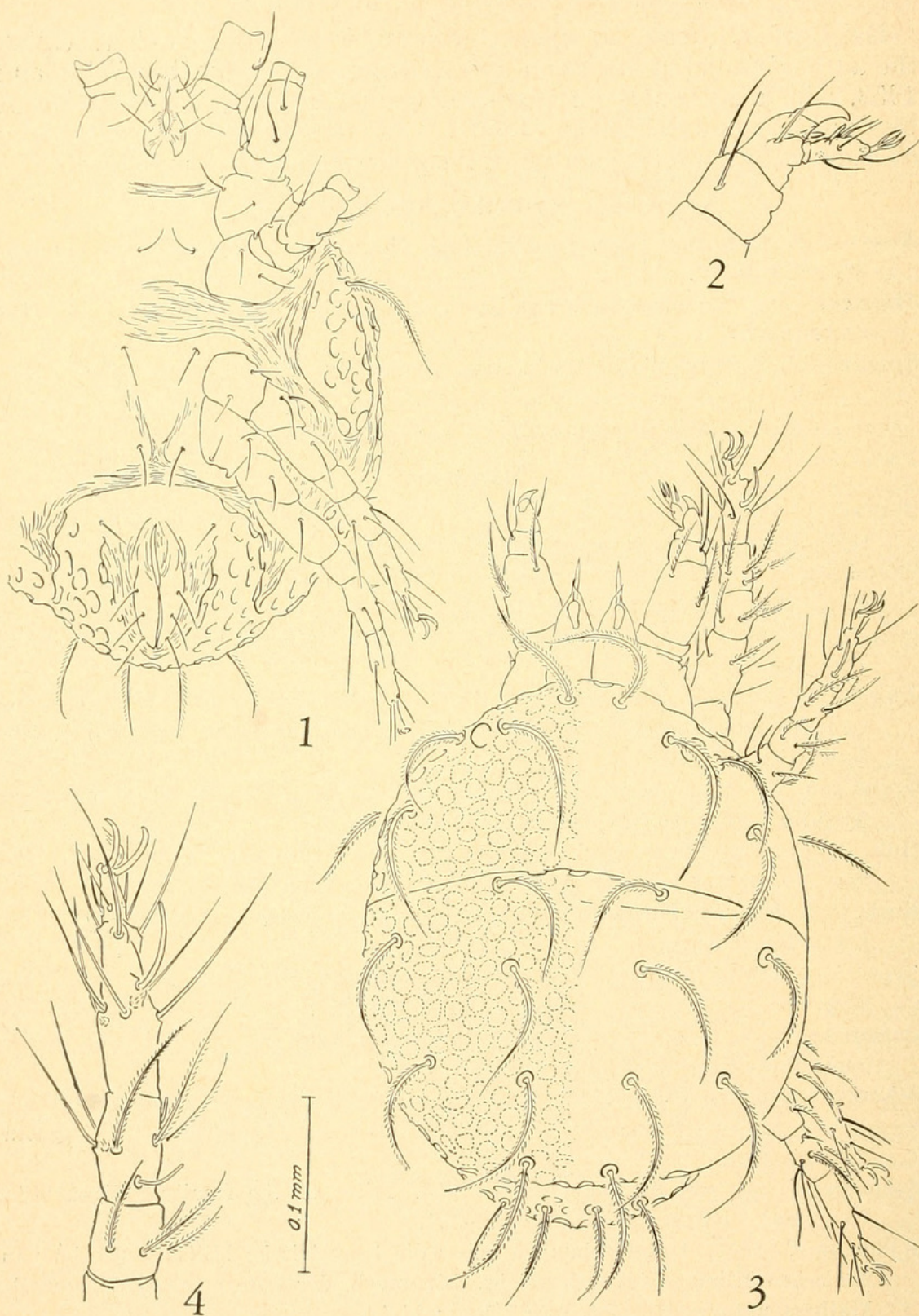
Species.—*N. insolitus* Willm. 1952, type species by original designation.

*N. spectabilis* (Summ. and Schl.), 1955. NEW COMBINATION.

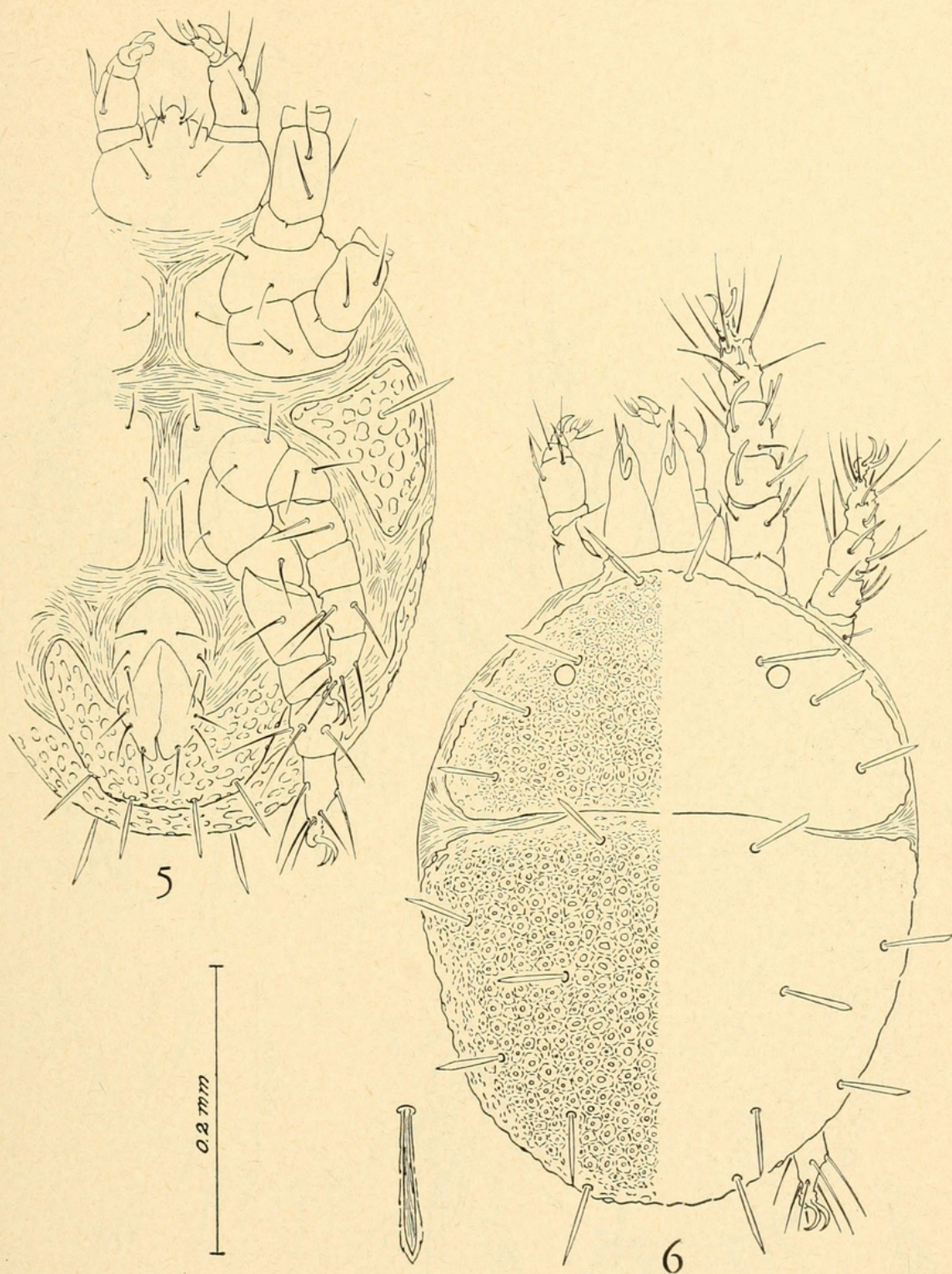
*N. terrestris* (Summ. and Schl.), 1955. NEW COMBINATION.

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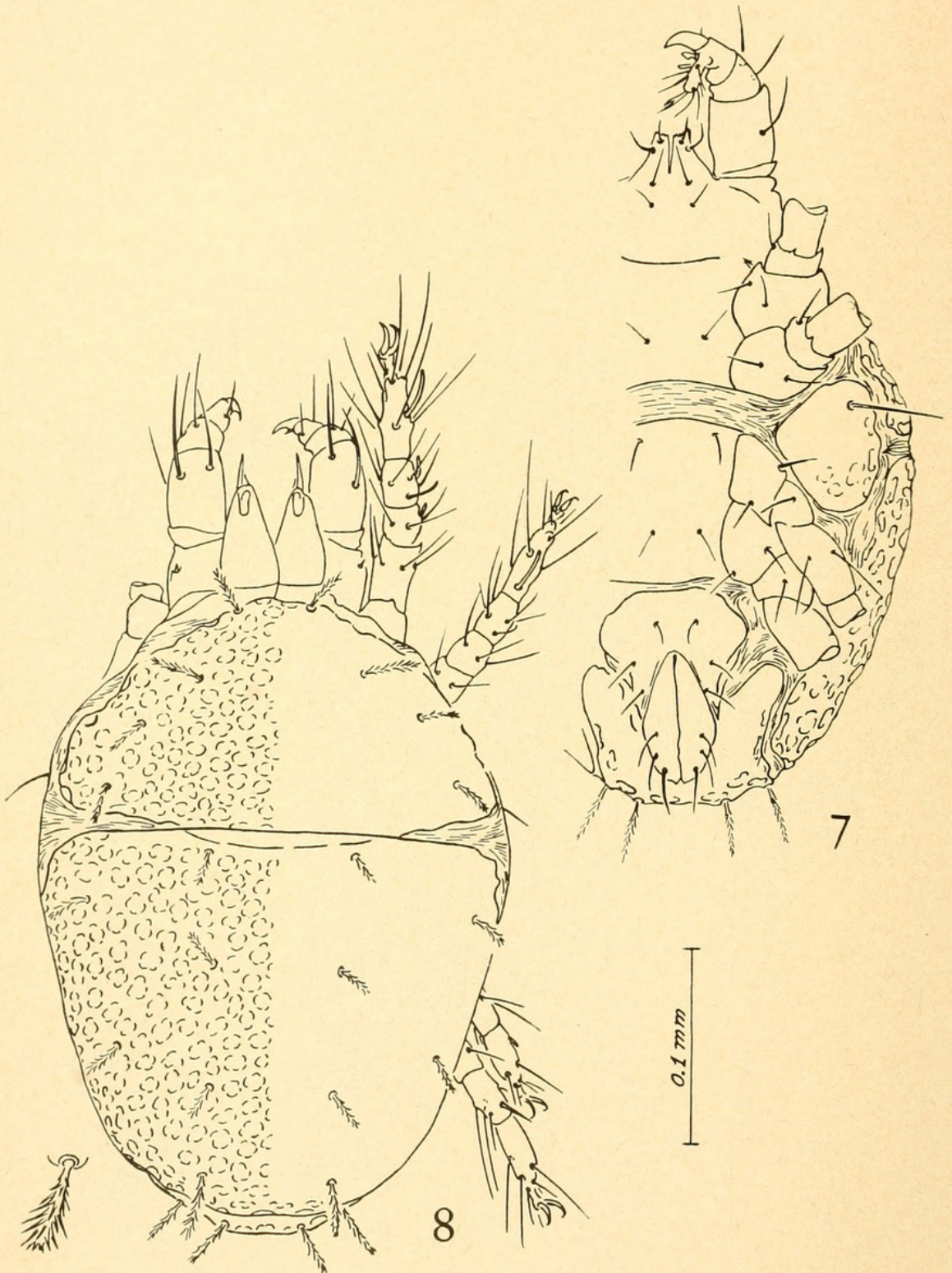
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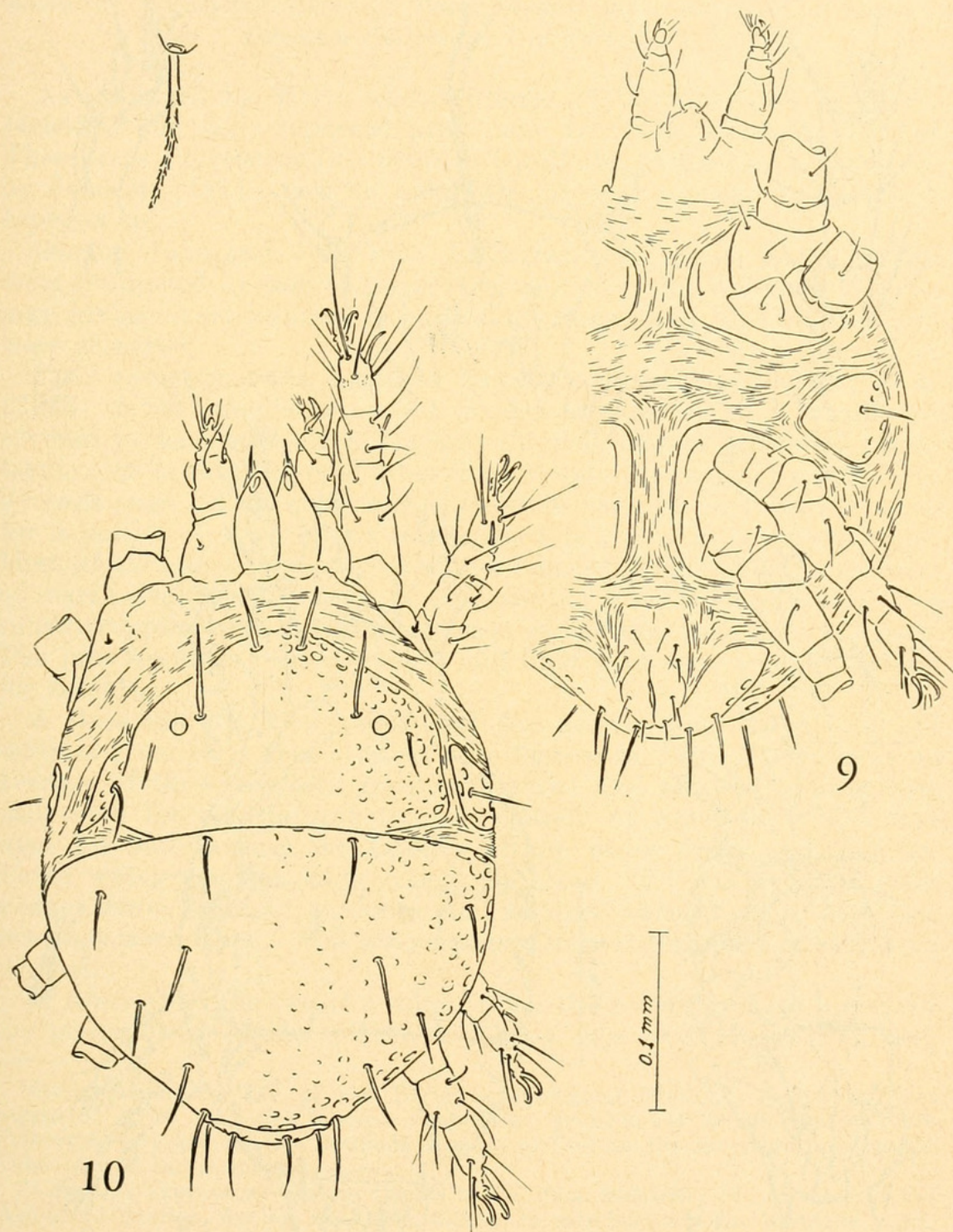
*Ledermuelleria segnis*. Fig. 1, Ventral aspect of female; fig. 2, right palpus; fig. 3, dorsal surface; fig. 4, first leg of right side. (Millimeter scale applicable only to the two large figures.)



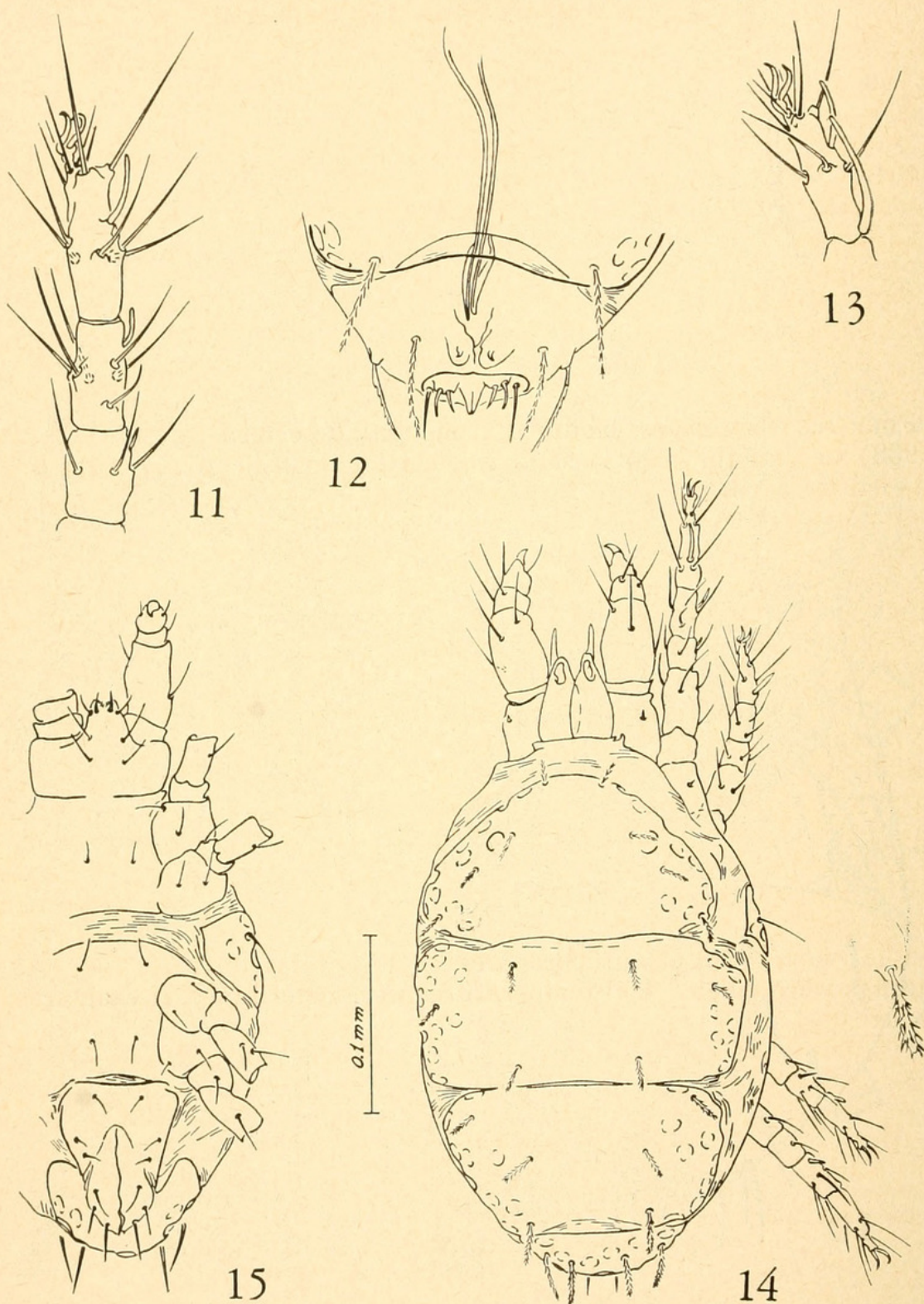
*Ledermuelleria clavata*. Fig. 5, Venter; fig. 6, dorsum of female.



*Ledermuelleria pectinata*. Fig. 7, Venter; fig. 8, dorsum of female.



*Ledermuelleria lacuna* n. sp. Fig. 9, Venter; fig. 10, dorsum of female.



*Ledermuelleriopsis plumosa*. Fig. 11, Right leg I of female; fig. 12, opisthosoma of male drawn from above; fig. 13, right tarsus I of male; fig. 14, dorsum of female; fig. 15, venter of female.



1957. "American species of *Ledermuelleria* and *Leder-muelleriopsis*, with a note on new synonymy in *Neognathus*." *Proceedings of the Entomological Society of Washington* 59, 49–60.

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